

CLASS 374, THERMAL MEASURING AND TESTING

SECTION I - CLASS DEFINITION

This is the generic class for making a determination of either (1) a characteristic or condition of an object or system utilizing heating or cooling as a significant part of the test and not provided for in other classes, or (2) a thermal quantity or condition.

This class also includes circuitry and devices with structure unique to a thermal measurement or test and not elsewhere provided for.

- (1) Note. Processes and apparatus are classified together.

SECTION II - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS

A thermal measurement or test made as part of a measurement elsewhere classifiable, e.g. liquid level or flow, will be classified with the other measurement. However, a thermal measurement combined with a separate measurement, so as to provide separate determinations are classifiable herein. (See Subclass References to the Current Class, below.)

Substantially all apparatus classes include automatic control of the apparatus. Such automatic control usually involves some means to measure or test a condition or change of condition, the measuring or testing means then operating to control or regulate the apparatus in accordance with the results of the measurement or test. For such subject matter, the class appropriate to the type of apparatus controlled should be investigated.

ORGANIZATION OF THIS CLASS

For the organization of this class, see Subclass References to the Current Class, below.

SECTION III - SUBCLASS REFERENCES TO THE CURRENT CLASS

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 1, through 28 and 43 through 57, Thermal Testing subclasses provide for determination of either a thermal characteristic of, or the thermal dependence of a nonthermal characteristic of, a test specimen. Also included herein is the ther-

mal determination of a nonthermal property not elsewhere provided for.

- 29, through 42, Heat and Heat Flux Measurement subclasses provide for determination of heat energy, rate of heat transfer, and other miscellaneous thermodynamic potentials (e.g., enthalpy).
- 100, through 207, Temperature Measurement subclasses provide for quantitative determination of temperature and temperature-related composite quantities.
- 142+, for a thermal measurement combined with a separate measurement, so as to provide separate determinations.
- 208, and 209, Specialized Subcombinations subclasses provide for devices having structure peculiar to thermal measuring and testing which perfects, but does not perform the determination.
- 210, Miscellaneous subclass provides for subject matter under the class definition and not found above.

SECTION IV - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

- 60, Power Plants, subclasses 516+ for expansion and contraction mechanisms, in general.
- 73, Measuring and Testing, appropriate subclasses for measuring a nonthermal variable by a thermal measurement, particularly subclasses 25.01+ for thermal gas analysis; subclasses 61.75 and 61.77 for a heat determination of the content or effect of a constituent of a liquid mixture; subclass 154 for thermal logging of a formation in a borehole; subclasses 204.11+ for thermal volume or rate of flow determination; and subclass 295 for thermal liquid level determination.
- 92, Expansible Chamber Devices, subclasses 34+ for a bellows chamber, per se; and subclasses 89+ for a diaphragm, per se.
- 99, Foods and Beverages: Apparatus, subclasses 342+ for a condition indicator for a cooking arrangement.
- 126, Stoves and Furnaces, subclass 388.1 for an open-top liquid heating vessel that may include a lid and an indicator or signaler feature.
- 128, Surgery, subclass 736 for a diagnostic temperature measuring arrangement particularly limited by structure to shape of, or placement in or on, a living body.

- 137, Fluid Handling, subclasses 551+ for fluid handling with condition responsive indication.
- 219, Electric Heating, subclass 248 for a flat iron with a condition responsive indicator.
- 236, Automatic Temperature and Humidity Regulation, subclasses 2+ for incubator control, and subclass 94 for thermostatic temperature control with an indicator.
- 237, Heating Systems, subclass 3 for an incubator heating system.
- 250, Radiant Energy, subclasses 338+ for an infrared radiometer.
- 251, Valves and Valve Actuation, subclass 11, for a heat motor actuated valve.
- 261, Gas and Liquid Contact Apparatus, subclass 39 for a thermostatic carburetor.
- 266, Metallurgical Apparatus, subclass 99 for a metallurgical device with a condition responsive indicator.
- 361, Electricity: Electrical Systems and Devices, subclass 93.8 for abnormal current condition detecting by thermal sensing.
- 366, Agitating, subclass 142 for agitating structure with a condition responsive indicator.
- 399, Electrophotography, subclasses 67+ for controls of fixing, particularly subclass 70 for temperature control of a warm-up or standby mode and subclass 94 for internal machine environment temperature.
- 428, Stock Material or Miscellaneous Articles, subclass 35 for a thermometer bulb, per se; and subclass 616 for a bimetallic element, per se.

SECTION V - GLOSSARY

HEAT

Kinetic energy of macroscopically non-observable random modes of motion of atoms and molecules.

TEMPERATURE

A quantitative measure of the ability of a substance to transmit or receive heat energy.

THERMAL

Related to heat or temperature.

THERMAL CHARACTERISTIC

A property of matter related to heat or temperature.

THERMAL PARAMETER

Heat, temperature, or a thermodynamic quantity related thereto.

THERMAL MEASUREMENT OR TEST

A determination of a thermal quantity, or a determination of a quantity made under a controlled thermal condition.

SUBCLASSES

1 THERMAL CALIBRATION SYSTEM:

This subclass is indented under the class definition. Subject matter for determining the accuracy, operability, or operating characteristics of a device responsive to a thermal condition.

- (1) Note. The calibration may involve either a single value or plural values including a continuous variation.
- (2) Note. The thermal condition responsive device need not be a measuring or testing device, e.g. calibration of a thermostat is classifiable in this subclass.
- (3) Note. A measuring or testing device having a reference or calibrating element or subsystem is classified with the measuring or testing device.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclasses 1.01+ for calibrating or proving of a nonthermal condition responsive arrangement.
- 399, Electrophotography, subclasses 67+ for controls of fixing, particularly subclass 70 for temperature control of a warm-up or standby mode and subclass 94 for internal machine environment temperature.

2 By thermal radiation emitting device (e.g. blackbody cavity):

This subclass is indented under subclass 1. Subject matter wherein a reference thermal condition is thermal radiation given off from a radiating element.

- (1) Note. Such an element would include a blackened element adjacent a radiation transmitting element.
- SEE OR SEARCH CLASS:
250, Radiant Energy, subclass 393 for an invisible radiant energy source used in electrical signalling.
- 3 By immersion in liquid having controlled temperature:**
This subclass is indented under subclass 1. Subject matter wherein the reference thermal condition is a thermal parameter of a controlled temperature liquid bath.
- 4 LEAK OR FLAW DETECTION:**
This subclass is indented under the class definition. Subject matter for testing a solid material for a defect or undesired passage of fluent material therethrough.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
57, for detection of susceptibility to such a defect caused by a thermal effect.
- SEE OR SEARCH CLASS:
73, Measuring and Testing, subclasses 40+ for leakage testing by fluid pressure; and subclasses 104+ for surface or cutting edge testing, in general.
228, Metal Fusion Bonding, subclass 103 for similar subject matter in a welding process.
- 5 With heating or cooling of specimen for test:**
This subclass is indented under subclass 4. Subject matter wherein heat is applied to or extracted from the solid material to permit detection of a thermal anomaly.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
43+, for determination of a thermal parameter of an object, in general.
- 6 DISTANCE OR ANGLE:**
This subclass is indented under the class definition. Subject matter for determining an angle or distance by measuring a thermal property which varies therewith.
- SEE OR SEARCH CLASS:
33, Geometrical Instruments, appropriate subclasses for determination of spatial relationship by direct contact with a measuring element.
- 7 Thickness, erosion, or deposition:**
This subclass is indented under subclass 6. Subject matter wherein the distance measured is the thickness or change thereof of a solid body.
- 8 FLAMMABILITY TESTING:**
This subclass is indented under the class definition. Subject matter for determining the susceptibility of the test specimen to combustion.
- (1) Note. Included herein is burn rate determination.
- SEE OR SEARCH CLASS:
73, Measuring and Testing, subclass 36 for testing of illuminating gas, in general.
- 9 EMISSIVITY DETERMINATION:**
This subclass is indented under the class definition. Subject matter for determining the ability of an object to radiate energy in accordance with its temperature.
- (1) Note. Such a determination often includes heating the sample.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
32, for measuring total radiant energy emitted from a source. 126 and 128, for emissivity compensation of temperature measurement by thermally emitted radiant energy.
- 10 DIFFERENTIAL THERMAL ANALYSIS:**
This subclass is indented under the class definition. Subject matter which compares simultaneous thermal effects on a test specimen and a reference specimen of an applied variation in temperature.
- (1) Note. The reference specimen is usually inert (i.e. undergoes no thermodynamic phase changes) over the temperature range of interest.

(2) Note. The comparison is usually a differential determination of the specimen conditions being monitored (e.g. temperature difference).

(3) Note. The specimens being compared are exposed to similar environmental conditions.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

112+, for measurement of temperature difference, in general.

11 Detail of electrical heating control:

This subclass is indented under subclass 10. Subject matter having a particular circuitry arrangement for controlling heating of the test and reference specimens.

12 Detail of sample holder or support therefor:

This subclass is indented under subclass 10. Subject matter including structural detail of a specimen holder or of a holder supporting arrangement.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

208, for such a holder or support, per se.

13 Formed by thermoelectric element:

This subclass is indented under subclass 12. Subject matter wherein the specimen holder is composed of a thermoelectric junction.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

12, for such subject matter having a sample cup with a distinct thermoelement contained therein.

157, for a combined thermometer and sampling cup.

179+, for a thermometer having a thermocouple sensor.

SEE OR SEARCH CLASS:

136, Batteries: Thermoelectric and Photoelectric, subclass 231 for such a sample holder, per se.

14 THERMAL GRAVIMETRIC ANALYSIS:

This subclass is indented under the class definition. Subject matter for determining the change in mass or weight of a sample subjected to heat.

SEE OR SEARCH CLASS:

177, Weighing Scales, appropriate subclasses for weighing devices, per se.

15 BY APPLYING KNOWN THERMAL GRADIENT (E.G., INDICATION OF RESPONSE BY LOCATION):

This subclass is indented under the class definition. Subject matter having an element with a temperature which increases in one direction according to the distance from a reference point so as to determine the relationship between a thermally responsive property and temperature by observation of the spatial distribution of the property.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

137, for determination of a temperature distribution, in general.

16 TRANSFORMATION POINT DETERMINATION (E.G., DEW POINT, BOILING POINT):

This subclass is indented under the class definition. Subject matter for determining the temperature at which a change of state or phase of the test specimen occurs.

(1) Note. The term "change of state" refers to changes between the gaseous, liquids, and solid states.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

15, for such determination using an applied thermal gradient.

17 By change in optical property (e.g., transmission):

This subclass is indented under subclass 16. Subject matter wherein the test is performed by determining a change in a light modifying characteristic of the test specimen or an element in contact therewith.

- 18 By reflection (e.g., polished surface):**
This subclass is indented under subclass 17. Subject matter wherein the light modifying characteristic is reflection from the specimen or an element in contact therewith.
- (1) Note. Included herein are total internal reflection within the specimen and mirrors contacting the specimen.
- 19 Sensed by instrument (e.g., photocell):**
This subclass is indented under subclass 18. Subject matter wherein the reflected light is sensed by an element responsive thereto.
- (1) Note. Such an element is often a photocell.
- SEE OR SEARCH CLASS:
250, Radiant Energy, subclasses 573+ for a prephotocell systems having fluent material in its optical path.
- 20 Controlling heating or cooling:**
This subclass is indented under subclass 19. Subject matter including a temperature modifying element for the specimen which modifying element is responsive to the light responsive element.
- 21 By electrical condition of specimen:**
This subclass is indented under subclass 16. Subject matter wherein the test is performed by determining the value, or its change, of an electrical property of the test specimen.
- 22 By change in motion of movable element:**
This subclass is indented under subclass 16. Subject matter wherein the test is performed by determining the modification of movement of a test element which contact or is located within the test specimen.
- 23 Driven element:**
This subclass is indented under subclass 22. Subject matter including an arrangement for applying a motion producing force to the movable test element.
- 24 By change in pressure or flow rate:**
This subclass is indented under subclass 16. Subject matter wherein the transition point is established by determination of a variation in
- either the force per unit area or the volume per unit time of a fluid specimen.
- 25 By thermal arrest (e.g., time-temperature curve):**
This subclass is indented under subclass 16. Subject matter wherein the transition point is established by locating the temperature at which there is no temperature change during heating or cooling of the specimen.
- (1) Note. The thermal arrest temperature is often located by use of a graph of time vs. temperature during heating or cooling.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
107, for measurement of the time rate of change of temperature.
- 26 Of molten metal (e.g., carbon content):**
This subclass is indented under subclass 25. Subject matter for determining a thermal arrest point of a molten metal.
- (1) Note. The thermal arrest point is often used to determine carbon content of the molten metal.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
139+, for molten metal temperature measurement, in general.
- 27 Between gaseous and liquid states:**
This subclass is indented under subclass 16. Subject matter where in the transformation point determination is between a gaseous and a liquid state, and not provided for in subclass
- (1) Note. Included herein are determination of a boiling or a condensation point.
- 28 Dew point:**
This subclass is indented under subclass 27. Subject matter wherein the change of state determined is that of the temperature at which condensation of a vapor in a sample begins, and not provided for in subclasses 17 - 26, above.
- (1) Note. The vapor is often water vapor.

- 29 HEAT FLUX MEASUREMENT:**
This subclass is indented under the class definition. Subject matter for determining the heat flowing through a unit area per unit time.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
31+, for measuring the total heat energy at a particular location.
- 30 By differential temperature measurement along undisturbed thermal gradient:**
This subclass is indented under subclass 29. Subject matter wherein the heat flux is determined by measuring the temperature difference across a thermal impedance without heating or cooling.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
112+, for measuring a temperature difference, in general.
- 31 CALORIMETRY:**
This subclass is indented under the class definition. Subject matter for determining a quantity of heat energy produced or absorbed at a given location.
- (1) Note. Calorimetric determination of the amount of constituent in a compound or of the heat of chemical combination is classified herein only when limited to a determination of heat produced by combustion of the specimen.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
10+, for calorimetric determination used in differential thermal analysis.
29, for measuring heat flow.
- SEE OR SEARCH CLASS:
23, Chemistry: Physical Processes, subclass 230 and 232 for processes involving heat measurement of a catalytic element, or with steps involving a chemical reaction other than combustion.
422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclass 51 for apparatus for heat measurement of a catalytic element, or with an arrangement involving a chemical reaction other than combustion.
- 32** This subclass is indented under subclass 31. Total radiant energy or power measurement: Subject matter for determining the total energy or power produced by a source of radiation.
- (1) Note. Microwave, other radio wave, X-ray and gamma ray radiation are excluded from this subclass.
- SEE OR SEARCH CLASS:
136, Batteries: Thermoelectric and Photoelectric, subclasses 213+ for a radiant energy sensing thermocouple.
250, Radiant Energy, appropriate subclasses for measurement of intensity or amplitude of an incident beam of radiant energy.
- 33 With control of heat added to or lost from a sample container (e.g., isothermal calorimetry):**
This subclass is indented under subclass 31. Subject matter including an arrangement to maintain or vary the heat energy of a receptacle containing a sample undergoing an endothermic or exothermic reaction.
- 34 With controlled adiabatic shield:**
This subclass is indented under subclass 33. Subject matter including an element in thermally conductive relation to the sample container and an arrangement to maintain the temperature of the element equal to that of the test location by heating or cooling the element so as to prevent heat flow between the element and the container.
- 35 Heat absorbing high temperature gas probe (e.g., enthalpy or fluid cooled probe):**
This subclass is indented under subclass 31. Subject matter for making a measurement of a thermal parameter of a hot gas including transfer of heat energy from the hot gas to a measuring element.
- (1) Note. The terms "hot" or "high temperature" to describe the gas are each intended to specify that the absolute temperature of the probe is very small compared to that of the gas.

- (2) Note. Included herein are enthalpy probes and probes with a fluid coolant therein.
- 36 Heat value of combustion (e.g., “calorific value”):**
This subclass is indented under subclass 31. Subject matter for determining the amount of heat produced by burning a given amount of a tested combustible material.
- 37 Having specified control of input of mixture:**
This subclass is indented under subclass 36. Subject matter having a structural detail of an adjustment of the amount of air or fuel admitted to the combustion location.
- (1) Note. The adjustment may be responsive to the temperature of the combustion exhaust fluid.
- 38 Having bomb or cartridge ignition chamber:**
This subclass is indented under subclass 36. Subject matter including a container resistant to high pressure produced by rapid ignition of the tested material.
- (1) Note. The ignition chamber is often immersed in a liquid, or includes and electrically operated igniting element.
- 39 Gain or loss of heat by heat utilizing load in path of heat exchange fluid:**
This subclass is indented under subclass 31. Subject matter wherein the heat measured is that taken from or added to a heat exchange fluid by a heat utilizing device through which the fluid flows.
- (1) Note. The term “heat utilizing device” is generally a heating or cooling device.
- 40 Determined by combining flow rate and temperature signals of heat exchange fluid:**
This subclass is indented under subclass 39. Subject matter including sensing of the flow rate and a temperature of the heat exchange fluid and combining signals representative thereof to produce a signal representing heat gain or loss.
- (1) Note. The temperature signal is often representative of the differential temperature of the fluid prior to and following heat exchange with the heat utilizing device.
- 41 Signals combined electrically:**
This subclass is indented under subclass 40. Subject matter wherein the temperature and flow rate are each sensed to produce an electrical signal and the signals are electrically combined.
- SEE OR SEARCH CLASS:
364, Electrical Computers and Data Processing Systems, subclass 464 for similar subject matter with details limited to a calculating arrangement.
- 42 Throttling calorimeter (e.g., steam quality):**
This subclass is indented under subclass 31. Subject matter for measuring a heat energy property of a gas or vapor including flow of the gas or vapor through a restriction as part of the measurement.
- (1) Note. Such devices are often used to determine “steam quality” which is the fraction of moisture in the liquid state carried by flowing steam.
- SEE OR SEARCH CLASS:
73, Measuring and Testing, subclass 23.2 for determination of gas composition, in general.
- 43 DETERMINATION OF INHERENT THERMAL PROPERTY (E.G., HEAT FLOW COEFFICIENT):**
This subclass is indented under the class definition. Subject matter for ascertaining a specimen's ability to transmit, transfer, retard, or spread heat and which includes heating or cooling of a portion of the specimen.
- (1) Note. Properties determined by such a measurement include thermal conductivity, thermal diffusivity, or heat transfer coefficient.
- (2) Note. Measurement of specific heat is made by calorimetry.

44 Thermal conductivity:

This subclass is indented under subclass 43. Subject matter for determining the coefficient of heat flow per unit area with respect to the temperature gradient.

SEE OR SEARCH THIS CLASS, SUBCLASS:

29, for determining heat flux, per se.

45 THERMAL TESTING OF A NONTHERMAL QUANTITY:

This subclass is indented under the class definition. Subject matter for performing a measurement or test of other than a thermal quantity either (1) with a specified thermal condition, or (2) to ascertain the dependence of the quantity upon a thermal condition.

(1) Note. The thermal condition is usually temperature or heat.

(2) Note. Nominal recitation of thermal recitation combined with a test classified elsewhere is classified with the other test.

SEE OR SEARCH CLASS:

164, Metal Founding, subclass 151.4, 154.6, and 155.6 for metal casting apparatus which may detect a nonthermal condition using a thermal sensor.

46 With loading of specimen (e.g., stress or strain):

This subclass is indented under subclass 45. Subject matter wherein the nonthermal test includes direct application of a mechanical force to a test specimen.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 788+ for testing by loading of a specimen, in general.

47 Cyclic:

This subclass is indented under subclass 46. Subject matter wherein the loading is repeatedly varied during the test.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 808+ for testing a specimen by applying a cyclic load, in general.

48 Torsional:

This subclass is indented under subclass 47. Subject matter wherein the repetitive loading tends to twist the specimen.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclass 814 for testing by cyclic application of a torsional load, in general.

49 Tensile:

This subclass is indented under subclass 46. Subject matter wherein the loading is a pull tending to stretch the specimen.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 826+ for tensile testing, in general.

50 With detail of heating or cooling structure:

This subclass is indented under subclass 49. Subject matter having a structural detail of an element of an arrangement for applying heat to, or extracting heat from, the specimen.

51 Compressional:

This subclass is indented under subclass 46. Subject matter wherein the load tends to squeeze the specimen.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclass 818 for compressional testing, in general.

52 Bending or flexing:

This subclass is indented under subclass 46. Subject matter wherein the test specimen has a long axis which the load tends to deform.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclass 849 for testing by bending or flexing, in general.

53 Of cure or hardenability:

This subclass is indented under subclass 45. Subject matter wherein the nonthermal quantity is either the degree of polymerization of a

polymerizable substance, or the depth to which a hardening of an outer layer of metal extends.

- (1) Note. The hardening of a layer of metal is often produced by quenching.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

47+, for determination of cure by cyclic loading.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses
78+ for hardness testing, in general;
and subclasses 808+ for testing by
cyclic loading, in general.

54 Of fluid volume or property (e.g., evaporation rate, flow rate):

This subclass is indented under subclass 45. Subject matter wherein the nonthermal quantity is the amount of a fluid or the rate of change of a flow property or evaporation.

SEE OR SEARCH CLASS:

164, Metal Founding, subclass 450.3 for a metal casting apparatus wherein material level maybe measured with a thermal sensor.

55 Expansion or contraction characteristic (e.g., dilatometry):

This subclass is indented under subclass 45. Subject matter wherein the measurement is of a temperature dependance of a dimensional change of a test specimen.

SEE OR SEARCH CLASS:

33, Geometrical Instruments, subclass
147 for an extensometer, per se.

56 Including electrical sensor:

This subclass is indented under subclass 55. Subject matter including a deformation responsive electrical sensing element.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses
763+ for electrical deformation measurement, in general.

57 Of susceptibility to thermally induced deterioration, flaw, or failure:

This subclass is indented under subclass 45. Subject matter for determining the properties of a specimen with respect to breakdown of structural integrity or of degeneration of a characteristic by heating or cooling of the specimen.

- (1) Note. Such determination may further include application of other energy (e.g., radiation) to the specimen.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

4+, for determination of an existing flaw.

100 TEMPERATURE MEASUREMENT (E.G., THERMOMETER):

This subclass is indented under the class definition. Subject matter for making a quantitative determination of a temperature, or of a temperature-related parameter which is not otherwise classifiable.

- (1) Note. The term “quantitative” requires a numerical result of more than two values.

- (2) Note. The term “temperature-related parameter” is a quantity having a value that is a function of plural temperatures, or of temperature and another variable and not elsewhere classified, see subclasses 101+ below.

- (3) Note. A device providing the temperature determination is often designated as a “thermometer” or pyrometer”, both terms being used in this class.

- (4) Note. In this and indented subclasses the term “sensing” will denote the immediate effect of a parameter and the term “indicating” will denote the creation of a humanly perceptible action.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

31+, for a calorimeter including a thermometer.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 25+ for thermal gas analysis, subclasses 75 and 77 for a thermal moisture content determination; subclasses 152.12+ for strata identification by thermal measurements in a bore hole; and subclass 295 for a thermal measurement to determine liquid level.

- 101 Composite temperature-related parameter:**
This subclass is indented under subclass 100. Subject matter wherein the quantitative determination is a continuous function of plural temperatures, or of temperature, and at least one other variable and which function is not otherwise classifiable.

(1) Note. The other variable may include time, radiation, etc.

- 102 Time-temperature relationship (e.g., integral, deterioration, change):**
This subclass is indented under subclass 101. Subject matter wherein the quantitative determination is either, (1) functionally dependent upon, or (2) limited to the time elapsed during the measurement.

(1) Note. Included herein are measurements of time-temperature integrals or other deterioration representative functions.

- 103 Time-temperature integration performed by particular circuit arrangement:**
This subclass is indented under subclass 102. Subject matter having a detail of a component or arrangement of circuitry which integrates a temperature-dependent electric signal with respect to time.

- 104 Peak (maximum or minimum) with respect to time:**
This subclass is indented under subclass 102. Subject matter wherein the determination is of a temperature having a value, or difference in value from a reference temperature exceeding all other such temperatures during a measuring interval.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

111, for a determination of the highest or lowest of plural spaced apart temperatures.

- 105 Indicating tube with sensing material return prevention:**

This subclass is indented under subclass 104. Subject matter wherein the determination is made by an indicating tube type thermometer with an irregularity in its axial bore between the bulb and scale of the thermometer so as to prevent the expansible material therein from returning to the bulb.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

192, for an indicating tube thermometer with a holder for shaking.

- 106 Permanent visual indication (i.e., irreversible):**

This subclass is indented under subclass 104. Subject matter wherein the determination is made using an arrangement which changes with a change in temperature in only one direction, i.e. restoring the temperature to its initial value does not restore the arrangement to its original condition.

(1) Note. Included herein are arrangements having color change, fusible, or diffusion properties.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

160, for a reversible fusible thermometer.
161+, for a reversible optical property thermometer.

- 107 Rate of change:**
This subclass is indented under subclass 102. Subject matter where the determination is of the time derivative of temperature.

- 108 Degree-days:**
This subclass is indented under subclass 102. Subject matter wherein the composite function is the product of the difference of the temperature from a reference temperature and the number of days elapsed.

- (1) Note. The subject matter herein generally includes a clock running at a rate dependent upon the outdoor temperature difference below a reference temperature.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
109, for a climate related composite thermal measurement, in general.
- 109 Climate related (e.g., wind-chill factor, discomfort index):**
This subclass is indented under subclass 101. Subject matter wherein the composite function is related to atmospheric conditions.
- (1) Note. Included herein are such quantities as wind-chill factor and discomfort index.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
108, for a degree-day measurement.
- SEE OR SEARCH CLASS:
73, Measuring and Testing, subclasses 170.01+ for nonthermal meteorological measurement; and subclasses 335.08+ for wet and dry thermal sensors to determine atmospheric humidity.
- 110 Plural spaced temperature function:**
This subclass is indented under subclass 101. Subject matter wherein the quantitative determination is a single function of the temperatures of plural spaced-apart points.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
124, for a temperature distribution display by thermal radiation.
137, for temperature distribution or profile.
- 111 Highest or lowest of spaced temperatures:**
This subclass is indented under subclass 110. Subject matter wherein the resultant measurement is the highest or lowest temperature at several points.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
104+, for a determination of the maximum or minimum temperature during a time interval.
- 112 Difference or gradient:**
This subclass is indented under subclass 110. Subject matter wherein the resultant measurement is the difference between the temperatures at two of the spaced-apart points or the ratio of such a difference to the distance between the two points.
- 113 By thermoelements connected in series opposition:**
This subclass is indented under subclass 112. Subject matter wherein the difference is sensed by two thermoelectric current generators having a single current path therethrough and connected with the potentials in opposing directions along the current path.
- 114 By current modifying elements in circuit (e.g., bridge):**
This subclass is indented under subclass 112. Subject matter having plural elements with a temperature-dependent impedance and so connected between a power source and output so as to produce a signal related to the temperature difference at the output.
- (1) Note. A bridge having such sensing impedance elements in adjacent arms is classified in this subclass.
- 115 Space average:**
This subclass is indented under subclass 110. Subject matter wherein the resultant measurement is the summation of temperatures at the spaced apart points divided by the summation of said points.
- (1) Note. In this definition, the term "summation" includes integration over a continuous path as well as discrete additive summation so as to include averages over continuous as well as discrete measurement points.

116 By single sensor (e.g., elongate or with plural fluid intakes):

This subclass is indented under subclass 115. Subject matter having a sensor which is long enough to inherently average the temperature over its length.

- (1) Note. Included herein are arrangements with fluid temperature sensors having housing with multiple inlets along its length.

117 By a vibratory effect (e.g., resonant frequency, acoustical):

This subclass is indented under subclass 100. Subject matter wherein the temperature is determined by a parameter of a mechanical vibration.

- (1) Note. The mechanical vibration may be an acoustical wave.
- (2) Note. The parameter may be the frequency of mechanical or acoustic resonance of an element.
- (3) Note. A temperature-responsive crystal controlling an oscillator in a thermometer is classified herein.

SEE OR SEARCH THIS CLASS, SUBCLASS:

163+, for other thermometers having an oscillator, particularly 170+, for digital output thermometers.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclasses 570+ for testing by, or measurement or testing of, vibratory waves.
- 331, Oscillators, subclass 66 for a temperature controlled oscillator absent an indicating arrangement.

118 Resonant frequency by fluid flow:

This subclass is indented under subclass 117. Subject matter wherein the temperature is determined by the frequency of mechanical or acoustical resonance measured by fluid flow.

- (1) Such elements are often resonating chamber devices.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 135, for temperature measurement by fluid flow other than by resonant vibration production.

SEE OR SEARCH CLASS:

- 116, Signals and Indicators, subclass 137 for fluid flow acoustical generators, in general.
- 137, Fluid Handling, subclasses 804+ for fluidic oscillators absent an indicating arrangement.

119 Vibration velocity (e.g., echo timing):

This subclass is indented under subclass 117. Subject matter wherein the temperature is determined by the speed of a mechanical wave.

- (1) Note. the resonant frequency of a fixed wavelength element, although inherently a measure of vibration velocity, is classified in subclasses 117 and 118 above, without cross-reference to this subclass in the absence of a nonresonant variant of velocity determination.

120 In spaced noncontact relationship to specimen:

This subclass is indented under subclass 100. Subject matter having a temperature sensor separated from the object by an intervening space or material.

121 By thermally emitted radiation:

This subclass is indented under subclass 120. Subject matter wherein the temperature of a specimen is measured by measuring a parameter of the thermal radiation emitted therefrom.

SEE OR SEARCH CLASS:

- 136, Batteries: Thermoelectric and Photoelectric, subclasses 213+ for a thermoelectric sensor for a thermoelectric radiation pyrometer absent processing and indicating circuitry.
- 250, Radiant Energy, subclasses 338+ for infrared radiation responsive circuitry absent a temperature indication.
- 356, Optics: Measuring and Testing, subclasses 43+ for a pyrometer specifically limited to the optical wavelength

range of the electromagnetic spectrum.

122 By microwave arrangement:

This subclass is indented under subclass 121. Subject matter wherein the radiation measurement is performed directly by microwave signal processing components (e.g., waveguides).

SEE OR SEARCH CLASS:

343, Communications: Radio Wave, subclass 100 for measurement of microwave radiation intensity, in general.

123 Transparent material measurement or compensation (e.g., spectral line, gas, particulate suspension):

This subclass is indented under subclass 121. Subject matter including compensation for radiation transmitted through or blocked from the thermally emitting material.

- (1) Note. Measurements involving spectral line intensity or inversion, as well as reference emitters from transparency compensation are classified herein.

SEE OR SEARCH THIS CLASS, SUBCLASS:

129, for radiation thermometers with reference standards, in general.
161+, for temperature measurement involving a change in an optical property, absent evaluation of thermally emitted radiation.

124 With scanning or temperature distribution display:

This subclass is indented under subclass 121. Subject matter wherein the thermally emitted radiation from adjacent points of the emitting object is successively evaluated or wherein the quantitative or continuous variation of surface temperature is displayed in relationship to the points thereof.

SEE OR SEARCH CLASS:

348, Television, subclasses 164+ for infrared radiation responsive television, in general.

125 With fluid flow purging device:

This subclass is indented under subclass 121. Subject matter having an arrangement to produce a stream of fluid flowing past at least one element of a radiation analyzing arrangement in order to remove from the element, or the path between the element and the emitting object, particulate or other undesired material.

- (1) Note. The element is often an optical element (e.g., lens or window).
(2) Note. The fluid stream usually has an incidental cooling effect.

SEE OR SEARCH CLASS:

359, Optics: Systems (Including Communication) and Elements, subclass 509, for fluid stream particle control for optical elements, in general.

126 Having emissivity compensating or specified radiating surface:

This subclass is indented under subclass 121. Subject matter including an arrangement to provide, or to compensate for departure from, a fourth power dependence of the emitted radiation on the absolute temperature, or from the amount of radiation emitted by a completely black surface with an emissivity of one.

- (1) Note. Included herein are blackened surfaces or cavities contacting the material the temperature of which is being measured.

127 Having significant frequency limitation or relationship (e.g., peak, ratio):

This subclass is indented under subclass 121. Subject matter including a particular feature of the frequency of the thermal radiation, or a portion thereof, sensed to perform the temperature determination.

- (1) Note. The sensed parameter is often the intensity of the radiation at a given frequency.
(2) Note. Included herein are ratio pyrometer, devices determining the frequency of peak intensity, and devices having sensors with different frequency-intensity characteristics.

SEE OR SEARCH CLASS:

356, Optics: Measuring and Testing, subclass 45 for a plural color responsive optical pyrometer.

128 Having significant signal handling circuitry (e.g., linearizing, emissivity compensation):

This subclass is indented under subclass 121. Subject matter having details of a circuit which processes the sensed signal.

- (1) Note. Included herein is processing to obtain a signal linearly related to the temperature or compensating for the emissivity characteristics of the radiating object.

129 Comparison with radiation reference standard:

This subclass is indented under subclass 121. Subject matter including an arrangement for comparing the thermally emitted radiation to be measured with radiation from a reference emitter the radiation from which has a predetermined relationship to the emitter temperature.

- (1) Note. Such emitters often have a high emissivity factor (E1), and include blackened elements and blackbody cavity radiators.
- (2) Note. Comparison arrangement may include choppers alternating the measured and reference radiation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

2, for a reference radiating device which is not a part of a radiation thermometer.

126, for radiation temperature measuring with increasing the emissivity of the thermally emitting surface.

130 Optical system structure (e.g., lens):

This subclass is indented under subclass 121. Subject matter including a specific limitation of an element which changes the direction of the radiation.

SEE OR SEARCH CLASS:

359, Optics: Systems (Including Communication) and Elements, appropriate subclasses for optical modifying elements and systems, in general.

131 With radiation conducting element:

This subclass is indented under subclass 130. Subject matter including a generally elongate element for conducting radiation from one end to the other within the confines of the outer surface of the elongate element.

SEE OR SEARCH CLASS:

356, Optics: Measuring and Testing, subclass 44 for similar subject matter using radiation limited to the visual spectrum.

385, Optical Waveguides, appropriate subclasses, for light conducting elements, in general.

132 Sensor or mounting temperature control:

This subclass is indented under subclass 121. Subject matter including maintaining or modifying the temperature of the radiation detector or some portion thereof during radiation sensing.

133 Ambient temperature compensated (e.g., dummy sensor):

This subclass is indented under subclass 121. Subject matter having an arrangement to eliminate any effects caused by the temperature of the surroundings of the radiation sensor.

- (1) Note. Included herein are arrangements with an additional radiation sensor not exposed to the radiation to cancel the temperature effects on the radiation receiving sensor.

134 Extrapolation (e.g., simulation, heat flow):

This subclass is indented under subclass 120. Subject matter wherein the temperature at a location is measured by measuring temperature or heat flow at a point spaced from the location.

- (1) Note. The desired location is often inaccessible for measurement.

- (2) Note. Included herein are temperature and heat flow simulation or analog arrangement.
- (3) Note. Included herein are article simulation arrangements, such as dummy cans, to determine temperature of the article interior.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

29+, for heat flux measurement, per se.

135 By fluid flow within or to sensor (e.g., convection, heat transfer, differential pressure):

This subclass is indented under subclass 120. Subject matter including determination of some parameter of a flowing fluid in thermal relationship to an object at a location spaced away from the object.

- (1) Note. Convection current measurement is included herein.
- (2) Note. The parameters of the flowing fluid include flow rate, pressure, and temperature.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

138, 147 and 148, for direct sensing of fluid temperature.

136 Geophysical (e.g., well bore, underwater):

This subclass is indented under subclass 100. Subject matter for temperature determination beneath the surface of the earth or of a body of water.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

109, for plural or composite atmospheric temperature measurement.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 152.12+ for borehole formation logging by making a thermal measurement, subclass 152.33 for thermal rate of fluid flow measuring in a borehole; and subclasses 170.01+ for measurement of oceanographic or atmospheric phenomena, in general.

137 Temperature distribution or profile:

This subclass is indented under subclass 100. Subject matter for determination of the temperature along a path or on a surface and displaying in substantially continuous form the temperature at each point of the path or surface.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

124, for similar subject matter using thermally emitted radiation.

136, for similar subject matter particularly adapted for utility in geophysical measurement.

138 With fluid flow deflector:

This subclass is indented under subclass 100. Subject matter for measuring temperature of a flowing fluid which includes a deflector of the fluid.

- (1) Note. An example would be a deflector to suppress the effect of a boundary layer of fluid upon a temperature sensing element.

139 Of molten metal:

This subclass is indented under subclass 100. Subject matter wherein the sensor contacts a molten metal bath.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

26, for transformation point determination of molten metal.

SEE OR SEARCH CLASS:

164, Metal Founding, subclass 4 and 150.1 for a process and apparatus, respectively, for metal casting or mold making combined with condition indication.

266, Metallurgical Apparatus, subclass 87 for metal treating apparatus combined with a temperature sensor.

140 Lance (e.g., consumable):

This subclass is indented under subclass 139. Subject matter wherein the sensing arrangement includes an elongate housing containing a temperature sensor.

SEE OR SEARCH CLASS:

136, Batteries: Thermoelectric and Photoelectric, subclass 234 for a thermocouple molten metal lance having a covered and sealed sensing junction.

141 Combined with diverse art device:

This subclass is indented under subclass 100. Subject matter having significant temperature measuring detail combined with a device having another utility.

- (1) Note. Where significant detail of the other device additional to that above is claimed such a combination is classifiable with the other device and should be cross-referenced herein.
- (2) Note. The term "another utility" refers to a function which would still be performed if the temperature measurement limitations were removed, thus supports or viewing devices are not considered as having other utility.

SEE OR SEARCH THIS CLASS, SUBCLASS:

191, for an indicating tube thermometer with a viewing element.
194, for an indicating tube thermometer with a particular support.

SEE OR SEARCH CLASS:

277, Seal for a Joint or Juncture, for a generic sealing means or process, subclass 319 for a seal combined with a fluid temperature indicator, sampler or inspection feature.
313, Electric Lamp and Discharge Devices, subclass 10 for an electric lamp or tube having a thermometer combined therewith.
362, Illumination, subclasses 23+, particularly subclass 25 for an illuminating device for a thermometer.

142 With other measuring device:

This subclass is indented under subclass 141. Subject matter combined with a device for making a quantitative determination of a parameter other than temperature.

- (1) Note. The combination must make distinct determinations of the temperature and another parameter. See (2) Note in section II of the class definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

101+, for a single resultant indication of temperature and another condition.

143 Pressure:

This subclass is indented under subclass 142. Subject matter wherein the other measuring device provides quantitative determination of fluid pressure.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 384+ for barometers; and subclasses 700+ for fluid pressure measurement, in general.

144 With combustion engine:

This subclass is indented under subclass 141. Subject matter wherein the other device is a mechanical energy producer operating by combustion.

- (1) Note. This subclass includes a combination with either an internal or an external combustion engine.

145 Cooling system:

This subclass is indented under subclass 144. Subject matter wherein the temperature of the system for removing heat from the engine is determined.

- (1) Note. Such systems are often of the fluid circulation type.

146 Radiator cap mounted thermometer:

This subclass is indented under subclass 145. Subject matter wherein the cooling system has a radiator with a cap having the thermometer mounted thereon.

147 With fluid carrying conduit (e.g., shower pipe):

This subclass is indented under subclass 141. Subject matter for determining the temperature of a fluid flowing within a tubular element.

- (1) Note. Such combinations often include structure for maintaining contact between a temperature sensor and the conduit.
- 148 Sensor within conduit:**
This subclass is indented under subclass 147. Subject matter wherein a thermometer sensing element or cover therefor protrudes within the conduit.
- (1) Note. Included herein are sensor wells into which temperature sensors may be placed.
- 149 With cooking compartment or door thereof (e.g., oven):**
This subclass is indented under subclass 141. Subject matter wherein the thermometer is mounted in or on an oven, or door thereof.
- (1) Note. Where significant detail of the oven is claimed, classification is in the appropriate class therefor.
- 150 With bottle (e.g., nursing):**
This subclass is indented under subclass 141. Subject matter wherein the device of other utility is a container for liquid storage.
- (1) Note. Included herein are infant feeding bottles.
- SEE OR SEARCH CLASS:
215, Bottles and Jars, subclass 11 for nursing bottle structure.
- 151 With confection or infant pacifier:**
This subclass is indented under subclass 141. Subject matter wherein the thermometer is combined with an edible casing or a teething device.
- 152 With electrical component (e.g., transformer):**
This subclass is indented under subclass 141. Subject matter wherein the other device is a current handling component of an electric circuit.
- (1) Note. Examples of such components are transformers, inductors, etc.
- SEE OR SEARCH CLASS:
361, Electricity: Electrical Systems and Devices, subclass 93.6 for safety and protection arrangements for electrical components including transformer sensor.
- 153 With roll or rotary specimen or support:**
This subclass is indented under subclass 141. Subject matter wherein the temperature of an angularly rotatable cylindrical element or of material contacting the element surface is measured
- 154 With coupling between rotating sensor and stationary electrical circuitry:**
This subclass is indented under subclass 153. Subject matter including an arrangement to couple a sensor located in or on the rotating element, and including indicating circuitry which does not rotate.
- 155 With piercing element:**
This subclass is indented under subclass 141. Subject matter wherein the diverse art device is an object penetrating element to enable interior temperature measurements of objects.
- (1) Note. A piercing element integral with a temperature probe is considered to have independent utility whether or not explicitly disclosed.
- 156 With float:**
This subclass is indented under subclass 141. Subject matter wherein the diverse art device is a buoyant element which supports the thermometer in spaced relation to a liquid surface.
- (1) Note. The buoyant action of a float is considered to make the float a device of independent utility, rather than a static support excluded from subclass 141 and its indented subclasses.
- SEE OR SEARCH CLASS:
73, Measuring and Testing, subclass 322.5 for a float, per se.

157 With sampling cup:

This subclass is indented under subclass 141. Subject matter wherein the diverse art device is a holder or container for obtaining a volume of material being measured.

- (1) Note. The temperature sensor may extend into the material within the sampler.

SEE OR SEARCH THIS CLASS, SUBCLASS:

140, for such a device in a molten metal lance.

158 With removable cover for sensor (e.g., disposable sheath):

This subclass is indented under subclass 100. Subject matter including an element particularly adapted to fit over a temperature sensor during a measurement.

- (1) Note. Included herein are also probe-cover subcombinations not elsewhere classifiable.

SEE OR SEARCH THIS CLASS, SUBCLASS:

209, for removable probe covers, per se.

SEE OR SEARCH CLASS:

136, Batteries: Thermoelectric and Photoelectric, subclasses 230+ for a thermocouple probe combined with a disposable sheath.

206, Special Receptacle or Package, subclass 306 for thermometer cases for storage, and for a package of disposable sheaths.

338, Electrical Resistors, subclasses 28+ for a resistance thermometer probe combined with a disposable sheath.

159 Nonelectrical, nonmagnetic, or nonmechanical temperature responsive property:

This subclass is indented under subclass 100. Subject matter wherein the temperature is determined by a change in a property of a sensing element and which property is other than magnetic, electrical, or mechanical.

- (1) Note. The term “mechanical” refers specifically to temperature dependent expansion or contraction.

- (2) Note. Such a property could include an optical property, luminescence, sorption, or a change of state.

160 Melting or softening:

This subclass is indented under subclass 159. Subject matter wherein the sensor changes between a solid and liquid state or changes its flow property.

161 Change of optical property:

This subclass is indented under subclass 159. Subject matter wherein the radiation transmission or reflection of the sensor changes.

- (1) Note. Such a property would be translucence or polarization.

162 Color:

This subclass is indented under subclass 161. Subject matter wherein the sensor changes color.

163 By electrical or magnetic heat sensor:

This subclass is indented under subclass 100. Subject matter including an element having a temperature responsive variation in an electrical or magnetic property thereof and an arrangement providing a quantitative indication from the variation.

- (1) Note. Included in this and its indented subclasses is circuitry peculiar to temperature measurement and not provided for elsewhere.

- (2) Note. Sensor structure, per se, is classified with the particular element structure (e.g. resistor, magnet, etc.).

SEE OR SEARCH THIS CLASS, SUBCLASS:

188, for a thermometer having a mechanical sensor and an electrical indicator.

SEE OR SEARCH CLASS:

257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), subclasses 53 through 56, 108, 414, and 467-470 for such devices used as temperature responsive devices, subclass 295 for insulated gate field effect devices with a ferroelectric layer, and subclasses 421-427 for magnetic field responsive devices.

164 With preheated sensing probe:

This subclass is indented under subclass 163. Subject matter included a housing having the thermal sensing element and an element for heating the housing to assist in the temperature determination.

- (1) Note. The heating is particularly to assist in the temperature measurement as, for example, to heat the probe to a nominal expected temperature. Heating of more general utility is classified in the appropriate class.

165 With heat exchanger or conductor:

This subclass is indented under subclass 163. Subject matter including an arrangement to conduct heat to the temperature sensing element.

166 At plural zones:

This subclass is indented under subclass 163. Subject matter having plural sensors at different locations for distinct temperature measurements of the several locations.

SEE OR SEARCH THIS CLASS, SUBCLASS:

110+, for a single function of plural spaced temperatures.

167 Scanning:

This subclass is indented under subclass 166. Subject matter including successive connection of the sensors of each location with the temperature measuring arrangement.

168 With self-rebalancing arrangement (e.g., servo-potentiometer, thermal link):

This subclass is indented under subclass 163. Subject matter including an electric circuit with an output which may be balanced by a variable

signal which is controlled by the output, and which variable signal is utilized as a measure of the magnitude of the sensor output.

- (1) Note. Included herein are servo-potentiometer and thermal links for rebalancing.

SEE OR SEARCH CLASS:

318, Electricity: Motive Power Systems, subclass 641 for a thermally controlled rebalancing bridge not specifically including an indicator.

169 With thermal lag compensation:

This subclass is indented under subclass 163. Subject matter including an arrangement to permit the indication of the measured temperature prior to the sensor reaching the measured temperature.

170 Digital output:

This subclass is indented under subclass 163. Subject matter including production of a pulse group in accordance with the sensed temperature.

SEE OR SEARCH THIS CLASS, SUBCLASS:

117, for similar subject matter where the signal is produced by a vibratory effect.

171 With digital linearizing circuitry:

This subclass is indented under subclass 170. Subject matter having electrical pulse or digital processing circuitry to modify the pulse group content in accordance with the value represented thereby in order to provide an output which is a linear function of the sensed temperature.

- (1) Note. The modification is generally the inverse function of the signal relationship to the temperature.

SEE OR SEARCH THIS CLASS, SUBCLASS:

172+, for response linearizing circuitry other than digital.

SEE OR SEARCH CLASS:

341, Coded Data Generation or Conversion, subclass 140 for an analog to digital converter circuit with transducer output linearization.

377, Electrical Pulse Counters, Pulse Dividers, or Shift Registers: Circuits and Systems, subclasses 27+ for similar subject matter including detailed structure of output counters.

172 With compensation for sensor nonlinearity or lead impedance:

This subclass is indented under subclass 136. Subject matter having circuitry to modify the signal representing the sensed temperature to form a signal which is linearly related to the sensed temperature, or which is independent of the impedance of leads connecting the sensor to the other circuit elements.

(1) Note. The signal modification for linearizing is generally the function inverse to the sensor temperature response.

(2) Note. The signal modification for impedance compensation may include three or more leads to a two terminal sensor, or separable (e.g. by polarity) signals energizing the sensor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

171, for such linearization by digital processing circuitry.

173 By feedback in amplifier circuit or with constant current source in circuit:

This subclass is indented under subclass 172. Subject matter wherein the signal modification is performed by either feedback circuitry of an amplifier, or circuitry of an amplifier, or circuitry including a constant current source.

174 By conductive fluid or work function within sensor (e.g., ionization):

This subclass is indented under subclass 163. Subject matter wherein the thermal sensor includes an envelope having a fluid or a vacuum therein, and electrodes to provide an electric current or space discharge therein, the temperature being determined by its effect on the discharge.

(1) Note. The temperature effect may be produced by variation in work function, ionization, or thermoelectric potential.

175 Thermal noise generated in conductor:

This subclass is indented under subclass 163. Subject matter responsive to an electric current produced by the thermal motion of molecules in the sensor.

176 Including sensor having hysteresis or cryogenic property (e.g., ferromagnetism, superconductivity):

This subclass is indented under subclass 163. Subject matter wherein the sensor has either a residual electric or magnetic field absent an external field applied thereto, or a property peculiar to temperatures near absolute zero.

(1) Note. Included herein are magnetized elements.

(2) Note. Included herein are superconductivity and certain paramagnetic-ferromagnetic transitions.

177 Ferroelectric:

This subclass is indented under subclass 176. Subject matter wherein the sensor has a spontaneous electrical polarization.

(1) Note. Included herein is an electret sensor in a thermometer.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclass 400 for electrets, per se.

178 By barrier layer sensing element (e.g., semiconductor junction):

This subclass is indented under subclass 163. Subject matter wherein the sensor is composed of semiconductive material having a potential barrier therein.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 512+ for temperature-responsive circuitry containing a non-linear solid-state element.

179 By thermoelectric potential generator (e.g., thermocouple):

Subject matter 163 wherein the element produces a temperature-dependent potential as a result of physical contact between two materials having different thermoelectric potentials at the measurement location.

- (1) Note. These are usually of the thermocouple type.

SEE OR SEARCH CLASS:

- 136, Batteries: Thermoelectric and Photoelectric, subclasses 200+ for thermocouples or thermal batteries, per se.
322, Electricity: Single Generator Systems, subclasses 33+ for a system including a thermal condition controlled generator or driving means therefor.

180 Specimen is part of thermoelectric circuit:

This subclass is indented under subclass 179. Subject matter including an electrical circuit path passing through the specimen as part of the thermoelectric potential generator.

181 Reference junction compensation:

This subclass is indented under subclass 179. Subject matter having a reference junction complementary to the measuring junction, and an arrangement to modify the output signal to eliminate the effect of temperature variation on the reference junction.

182 Reference junction temperature control:

This subclass is indented under subclass 179. Subject matter having a reference junction complementary to the measuring junction, and an arrangement to maintain the reference junction at a constant temperature.

183 By current modifying sensor:

This subclass is indented under subclass 163. Subject matter wherein the sensor has a temperature-responsive variation in electrical impedance from which the temperature determination is obtained.

- (1) Note. Included in this and indented subclasses are circuitry arrangements not specifically provided for in subclasses 164-182.

184 Reactive element (e.g., capacitive):

This subclass is indented under subclass 183. Subject matter wherein the temperature is sensed by a variation in the ratio of the voltage drop across the sensor to the quadrature current through the sensor.

- (1) Note. Systems having capacitive or inductive sensors are classified herein.

185 Detail of resistive sensor:

This subclass is indented under subclass 183. Subject matter including significant structure of a resistive sensing element.

SEE OR SEARCH CLASS:

- 338, Electrical Resistors, subclasses 25+ for resistance temperature sensors, per se.

186 With specified recording arrangement:

This subclass is indented under subclass 100. Subject matter having structure for generating a permanent or semi-permanent record of the measured temperature.

- (1) Note. A temperature measuring device including only nominal recitation of a recorder will be classified according to the temperature measuring structure.

- (2) Note. The record may be a visible representation.

SEE OR SEARCH CLASS:

- 346, Recorders, subclasses 33+ for recorders responsive to temperature.

187 Mechanical (e.g., expansion or contraction of material):

This subclass is indented under subclass 100. Subject matter wherein the quantitative temperature determination is given by a variation of force, position, or motion caused by a variation in a temperature-responsive mechanical property of a sensing material.

- (1) Note. Such mechanical properties include expansion or contraction.

- SEE OR SEARCH CLASS:
60, Power Plants, subclasses 516+ for expansion and contraction power plants.
- 188 Having electrical indication:**
This subclass is indented under subclass 187. Subject matter having electrical measurement of the mechanical variation to produce an electrical current for temperature determination.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
163+, for temperature determination by directly sensing a thermally variable electrical sensor parameter.
- 189 Plural zones (e.g., indoor-outdoor):**
This subclass is indented under subclass 187. Subject matter including plural distinct temperature measurements at distinct locations.
- (1) Note. The several indications of the measurements may be displayed at a single station.
- (2) Note. Included herein are coupled displays of indoor and outdoor temperature.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
110+, for a single function of plural spaced temperatures.
166+, for similar subject matter utilizing an electrical or magnetic heat sensor.
- 190 Indicating tube type:**
This subclass is indented under subclass 187. Subject matter wherein the expansion of a sensing or indicating material is visible through a transparent tube.
- (1) Note. The tube or its mounting usually has a graduated scale to provide a numerical indication.
- (2) Note. Although the material is usually a liquid, use of a gas or a semisolid material is included herein.
- 191 With optical element (e.g., magnifying):**
This subclass is indented under subclass 190. Subject matter combined with a distinct arrangement for optically modifying the temperature indication.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
193, for an indicating tube itself shaped so as to form an optical element.
- 192 With holder for shaking:**
This subclass is indented under subclass 190. Subject matter having an arrangement to assist in returning an expanded portion of the sensing material back to a reference or storage position.
- (1) Note. The reference or storage position usually refers to an enlarged bulb at the sensing portion of the thermometer.
- SEE OR SEARCH CLASS:
73, Measuring and Testing, subclass 335.09 for whirling psychrometers (i.e., wet and dry built thermometers mounted to be whirled on a support to cause wet bulb evaporation).
- 193 Having specified cross-section:**
This subclass is indented under subclass 190. Subject matter wherein the cross-section configuration of the transparent tube is particularly described.
- (1) Note. This subclass includes a transparent indicating tube shaped so as to form an optical element.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
191, for an indicating tube thermometer having a distinct optical element.
- 194 With support or housing:**
This subclass is indented under subclass 190. Subject matter combined with a particular mounting or enclosing arrangement for the thermometer.
- (1) Note. Such structure having any additional function than support or housing for the thermometer is classified in subclasses 141+, above.

195 With detail of motion transmitting mechanism:

This subclass is indented under subclass 187. Subject matter having significant detail of a mechanism for transmitting motion from a sensing element to an indicating element.

- (1) Note. The term “mechanism” requires at least two relatively moving elements.

196 One sensing element within another:

This subclass is indented under subclass 187. Subject matter having a compound sensing element with two distinct mechanical sensors one of which surrounds the other.

197 With compensation:

This subclass is indented under subclass 187. Subject matter having an arrangement to vary the indication in response to a condition other than the measured temperature.

198 With adjustment:

This subclass is indented under subclass 187. Subject matter having an arrangement to modify the temperature indication.

- (1) Note. Such adjustment is often performed manually.

199 Mechanical loading of sensor:

This subclass is indented under subclass 198. Subject matter including adjustment of the stress or tension applied to the temperature sensing element.

200 Adjustment of limit stop:

This subclass is indented under subclass 198. Subject matter including an adjustable element for limiting thermally caused motion of the temperature sensor.

- (1) Note. Included herein are screw-threaded stop elements.

201 Expanding fluid:

This subclass is indented under subclass 187. Subject matter using the temperature responsive expansion or contraction of a confined fluid to determine temperature.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 190+, for an indicating tube-type thermometer with an expanding fluid therein.

202 With distinct pressure transmitting fluid:

This subclass is indented under subclass 201. Subject matter having a solid force transmitting element applying pressure on a second confined fluid in response to the pressure of the sensing fluid, which second fluid pressure is measured to provide the temperature determination.

203 Bourdon tube or bellows:

This subclass is indented under subclass 201. Subject matter wherein the fluid is confined to an elastic tube having either (1) a flexible corrugated wall, or (2) a curved or twisted configuration such that an increase of fluid pressure tends to straighten the tube.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclass 729.1 for pressure measurement by a bellow; and subclass 732 for pressure measurement by a Bourdon tube.

204 Multiple distinct sensing elements:

This subclass is indented under subclass 187. Subject matter having a sensor including two or more separate elements cooperating to increase the mechanical variation causing indication.

- (1) Note. The separate sensing elements are located at a single location to increase the effect of temperature change.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 110+, for a single function of plural sensors in different locations.
189, for a mechanical thermometer indicating the temperatures at different locations.

205 Compound sensing element (e.g., bimetallic):

This subclass is indented under subclass 187. Subject matter having a solid sensing element composed of plural materials joined together along a surface.

206 Coil:

This subclass is indented under subclass 205. Subject matter in which the sensing element is continuously curved so as to form a spiral having plural turns.

SEE OR SEARCH CLASS:

206, Special Receptacle or Package, subclass 306 for a thermometer storage package.

207 Helix:

This subclass is indented under subclass 206. Subject matter wherein the spiral element extends in the direction of its axis of symmetry.

210**MISCELLANEOUS:**

This subclass is indented under the class definition. Subject matter not classifiable in any of the preceding subclasses.

END

208 HOUSING, SUPPORT, OR ADJUNCT:

Subject matter particularly adapted for enclosing, protecting, holding or otherwise perfecting subject matter classified in this class, but not of itself performing a measurement or test, and not elsewhere classified.

- (1) Note. A thermal measuring or testing arrangement including a housing, support or adjunct is classified in the appropriate preceding subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 12+, for detail of sample holder in a differential thermal analysis arrangement.
38, for calorimetric heat value ignition chamber detail.
192, for detail of a holder combined with thermometer.
194, for detail of a support or housing combined with thermometer.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, for an instrument casing for a measuring device, in general.

209 Removable probe cover:

This subclass is indented under subclass 208. Subject matter drawn to an element particularly adapted to fit over a temperature sensor during measurement.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 158, for the combination of a cover and a thermometer or thermometer probe.